Si III · OV bright line of scattering polarized light that has been observed in the CLASP and its Center-to-Limb Variation

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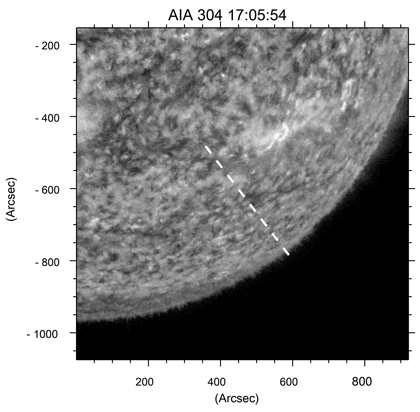
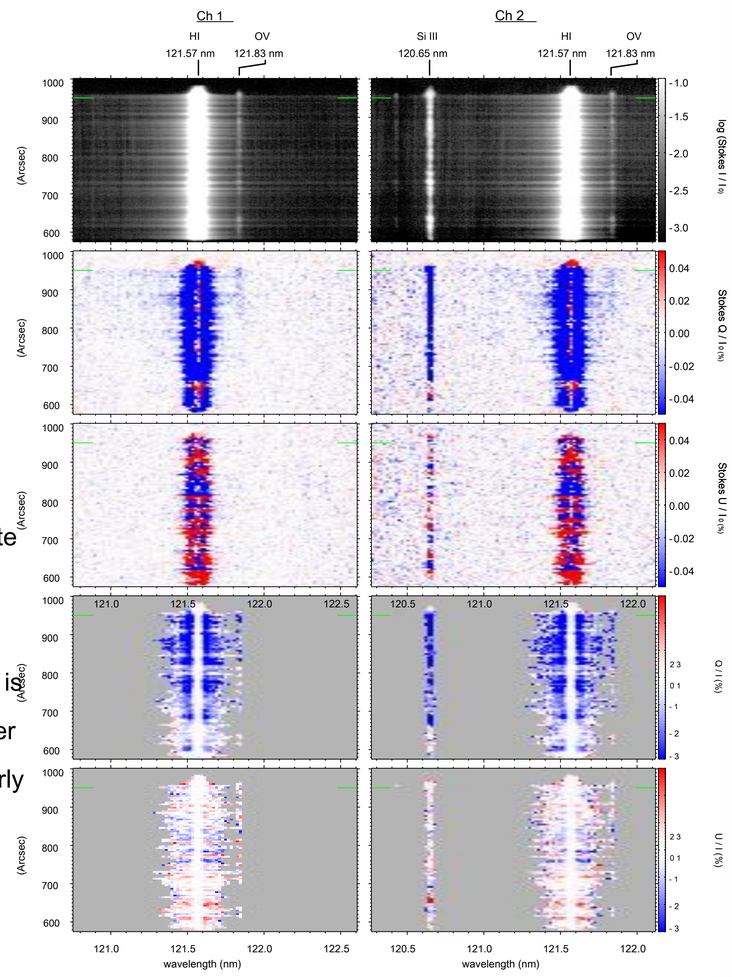
Observation of Si III · OV bright line due to the CLASP

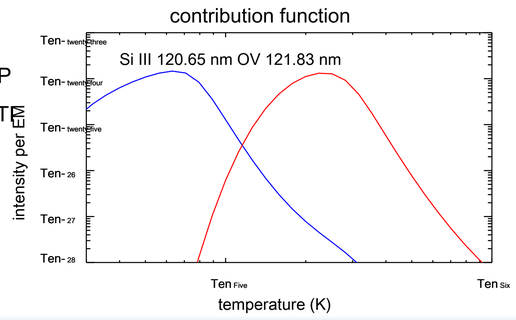
The CLASP (Chromospheric Lyman-Alpha Spectro- Polarimeter) rocket experiment, in addition to the ultraviolet region of the Ly α emission line (121.57 nm), emission lines of Si III (120.65 nm) and OV (121.83 nm) is can be observed. These are optically thin line compared to Lyα line, if Rarere captured its polarization, there is a possibility that dripping even a new physical diagnosis chromosphere-transition layer. In particular, OV bright line is Isa release from the transition layer, further, Three P One → One S 0 Is a forbidden line (cross-triplet transition between lines), it was not quite know whether to polarization.





λ (nm)	Line	Lower level	Upper level	A_{ki} (s^{-1})
120.65	Si III	$3s^2\ ^1S_0$	$3s3p\ ^1P_1$	2.6×10^9
121.57	H I	$1s\ ^2S_{1/2}$	$2p\ ^2P_{3/2,1/2}$	4.7×10^8
121.83	O V	$2s^2\ ^1S_0$	$2s2p\ ^3P_1$	2.4×10^3

Parameters of the observed spectral lines in the CLASP contribution was calculated using the (top) and CHIANTI function (right).

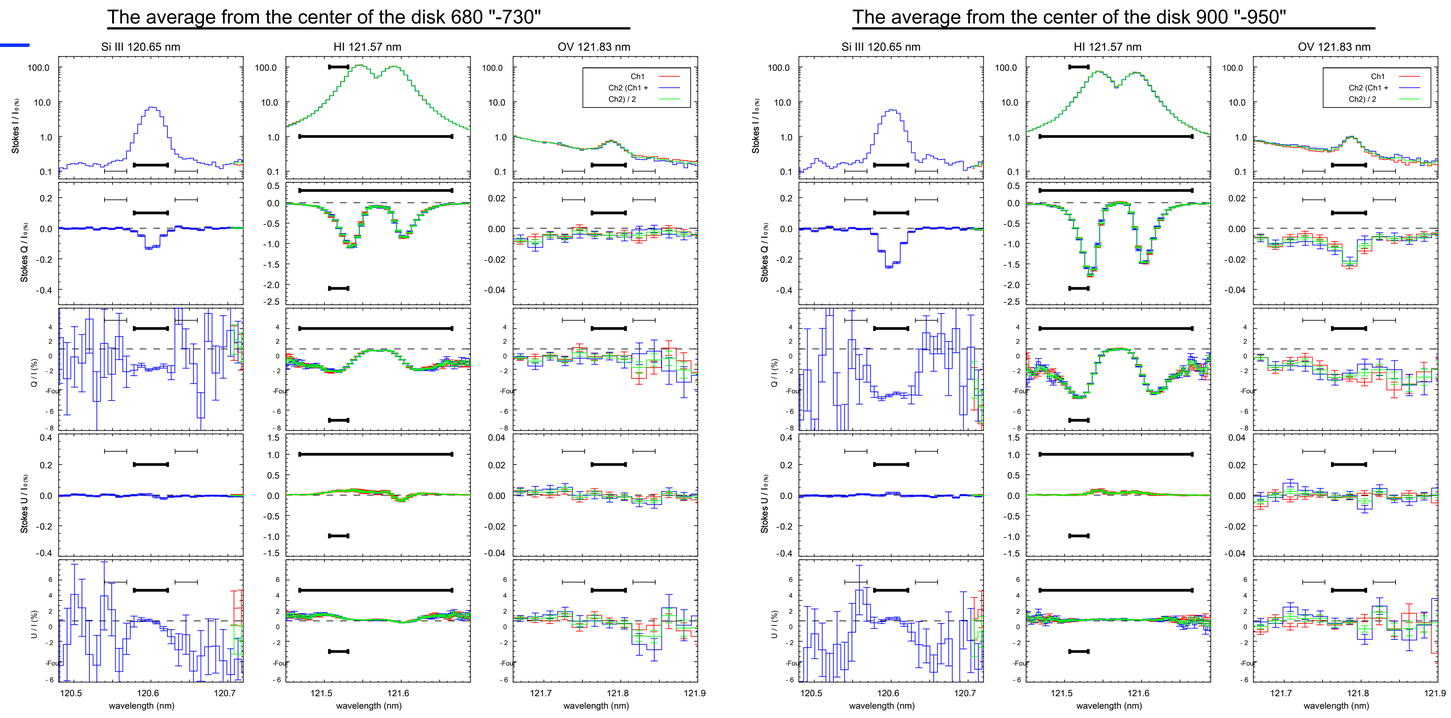


The high polarization measurement accuracy CLASP, polarization was found captured despite dark spectral lines. In particular, in the Si III emission line, Center-to-Limb Variation vertical linearly polarized light to the rim toward the rim is increased (CLV) is clear. OV bright line is darker than Si III emission line but perpendicular linearly polarized light to the rim was observed in the vicinity of the rim.

Polarization profile of Si III · OV bright line

Si III emission lines hardly affected by continuous light (wings mainly Lyα line), even at a distance from the rim, even near the rim negative Stokes Q (vertical linearly polarized light to the rim) was significantly measured. On the other hand, OV bright line is Keru strongly affected by the wing of Lyα line. In addition, Lyα line wing itself has also polarized light. Profile of Stokes Q indicates that the OV bright line is polarized significantly near the rim. It is a vertical linearly polarized light in the same way Trim and Lyα lines and Si III line.

Upon obtaining the CLV, they were evaluated both when subtracted with the absence subtracted continuous light (Wie ing of Lyα line).



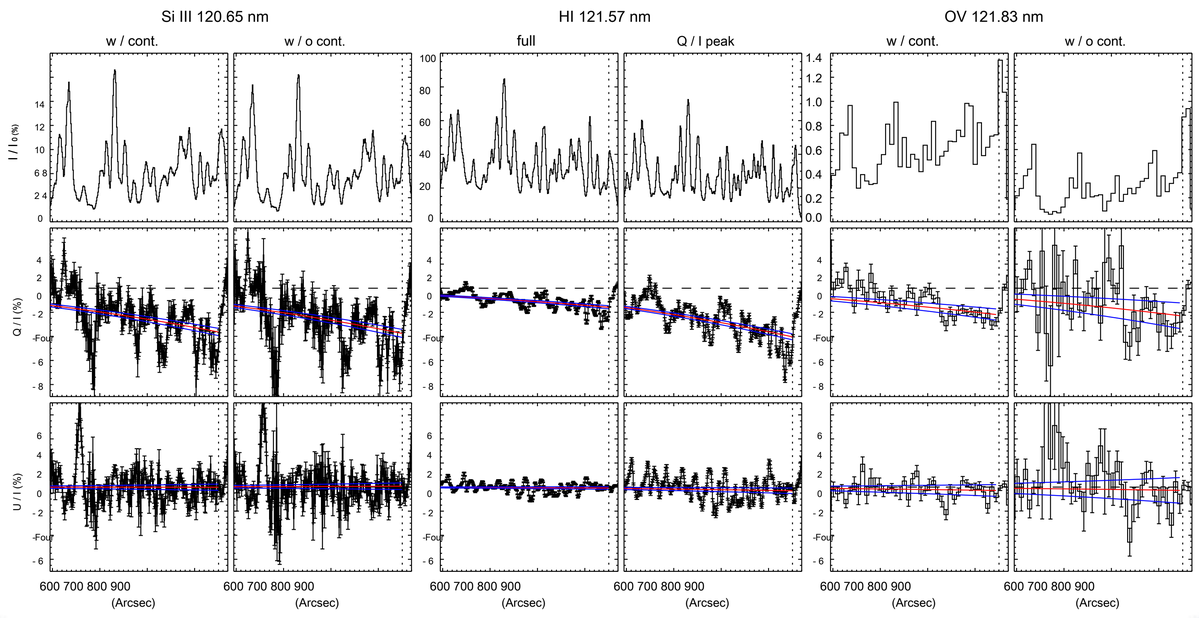
Si III, HI, polarization profile of OV bright line observed by CLASP. From above, Stokes I, Stokes Q, Q / I, Stokes U, U / I.

CLV of polarization in Si III · OV bright line

From the change in the Q / I and U / I of each spectral line along the slit, the coefficients of the right formula Center- to-Limb Variation (CLV) asked meta. Q / the I of Lyα line and Si III showed a clear CLV, it becomes approximately 4% of polarizing degree near the rim. OV-ray is in the order of about 2% and pull to the difference between the effects of continuous light (error 1σ = 0.4%). U / I do not exhibit significant CLV.

$$f_{Q/I}(\mu) = P_Q(1-\mu^2)$$
$$f_{U/I}(\mu) = P_U(1-\mu^2)$$

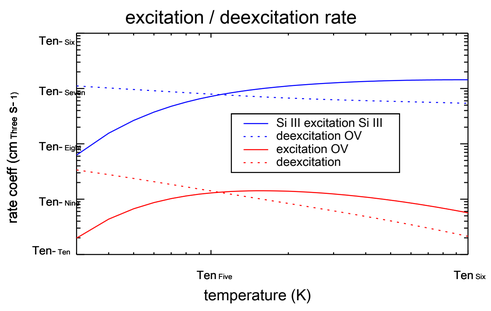
		P_Q (%)	P_U (%)
Si III 120.65 nm	w/ cont.	-3.6±0.1	0.0±0.1
	w/o cont.	-3.8±0.1	0.1±0.1
H I 121.57 nm	full	-1.6±0.1	-0.1±0.1
	Q/I peak	-4.0±0.1	-0.3±0.1
O V 121.83 nm	w/ cont.	-2.2±0.2	-0.3±0.2
	w/o cont.	-2.3±0.4	-0.3±0.4



OV-ray polarization generation mechanism of

Perpendicular linearly polarized in the rim, when the light chroma layer-transition layer thin lines forming layer is scattered more than once through, almost no contribution of vertical way direction of the radiation field, the horizontal direction of the radiation field dominated It can be explained by the scattering polarization that occurs in the context of. OV line A coefficient is 5-6 orders of magnitude smaller than the other line. In this case, there is a possibility that the atom deflection would have been drowned out by the collision. Typical electron density 10 of the transition layer Nine - Ten Eleven

cm- Three And given the excitation / de-excitation rate due to the collision (see below), it is largely of de-excitation rate due to radiation (A coefficient), scattering polarized light, it was confirmed that can occur there is enough. In addition, magnetic field strength work is Hanre effect is smaller than mG, there is also a possibility that the polarization becomes smaller in Hanre effect. However, OV bright line has a variety of magnetic field coordination in the thin line of sight direction optically



It is considered to be overlapping. At this time, the degree of polarization by Hanre effect is reduced to about 20%, not completely mean polarization disappears.